ORIGINAL

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems	)	
and Their Impact upon the	)	MM Docket No. 87-268
Existing Television Broadcast	)	
Service	)	

COMMENTS OF SONY CORPORATION OF AMERICA

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SUMMARY

The United States is poised to enter a new and exciting era of advanced television. As we enter this era, it is crucial that appropriate measures be taken to reduce the cost and to increase the availability of HDTV production and consumer equipment. The success of HDTV implementation will depend greatly upon exposing the public to the unique visual and aural qualities of ATV that are altogether different from NTSC. Such public exposure will not occur, however, unless there is industry consensus on a single HDTV production standard. Once such an agreement is reached, equipment manufacturers can increase their volume of production, which in turn will create economies of scale thus reducing the cost of such equipment and expediting provision of ATV service to the viewing public.

The United States already has developed a superb HDTV production standard, SMPTE 240/260M, that has achieved great acceptance and success throughout the world in broadcast, governmental, scientific, industrial, business and entertainment arenas. Additionally, the SMPTE 260M origination format can be transferred to 35mm film with outstanding quality, can be easily digitally downconverted to existing 525 and 625 television, and is fully compatible with ATV transmission formats proposed for the U.S. and Europe. On the basis of these proven performance characteristics and the associated cost savings, Sony urges adoption of SMPTE 240/260M as the U.S. HDTV production standard.

In addition to lowering the cost of HDTV origination equipment through agreement on a single production standard, Sony believes it is important to encourage consumer acceptance of and investment in this new technology. This will be a function of the price of the ATV receiver, consistent with the consumer's perception of the ATV presentation compared to contemporary NTSC service, the availability of ATV programming and the diversity of ATV delivery media.

Any simulcasting requirement must balance the need to protect the large investment in the installed base of NTSC equipment while affording maximum flexibility to allow ATV to achieve its full potential. Except for small screen portable NTSC receivers, which can be fed only through over-the-air transmission, we believe that multi-channel NTSC transmissions over non-broadcast media will protect and indeed encourage continued use of NTSC equipment.

Finally, HDTV implementation will be less disruptive if the Commission does not make a premature announcement of the termination of over-the-air NTSC broadcasting. The Commission's proposed 15 year termination date assumes that NTSC equipment will be obsolete by this time. However, Sony believes that new multi-channel NTSC services will be developed and promoted contemporaneously with ATV, thus spurring continued use of NTSC equipment for quite some time. Moreover, use of portable NTSC equipment will continue well into the HDTV era because HDTV

technology presently loses most of its advantages on small screen televisions. Finally, premature public announcement of the termination of NTSC service could result in serious marketplace disruptions in the sale of NTSC equipment, which could directly affect the livelihood of wholesalers and resalers throughout the country.

For these reasons, the Commission should postpone such announcement until HDTV achieves one percent penetration in the United States. This termination date should be reviewed again in the year when ten percent HDTV penetration rate is achieved. This two-step process will ensure that critical marketplace factors are taken into account in phasing out NTSC.

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Sony Corporation of America hereby submits its comments in response to the Second Report and Order/Further Notice of Proposed Rulemaking (hereafter referred to as the "Further Notice") released by the Commission on May 8, 1992. We hope that our comments will contribute to the important decisions yet to be made as the Commission seeks to bring the benefits of Advanced Television to the American viewing public.

I. BACKGROUND

A. Development of HDTV in the United States

The United States now stands at the threshold of the Advanced Television era. Soon the Commission will enter the final phase in selecting an ATV transmission standard that is anticipated to serve this country for decades to come. In large part because of the Commission's strong leadership and the stunning progress in digital data rate reduction technologies pioneered by American laboratories it now seems beyond dispute

that the system that ultimately is selected will be based upon all-digital principles.

The selection of such a technologically superior standard is a tribute to the leadership role that the United States long has played in the worldwide transition to HDTV. Early on, important industry groups in this country devoted an enormous amount of resources to the establishment of criteria and standards for HDTV production. The significant interests of the U.S. program production and distribution entities were recognized at the initial stage of this process. Hollywood film experts joined their television production and broadcast colleagues within SMPTE and ATSC from the very beginning of the HDTV committee work back in 1984. The cooperation of these diverse groups produced results which today are unparalleled in achieving an extremely close reconciliation of HDTV and motion picture film production. It would be an unfortunate and costly mistake if the benefits of this unique U.S. achievement were not fully realized.

Equally noteworthy was the early U.S. leadership in developing digital criteria for HDTV production -- long before the Commission began active consideration of ATV transmission standards. This work began as far back as 1985 within the ATSC (predating any equivalent effort elsewhere by some years) and was carried to fruition within the SMPTE, which produced the world's first all-digital HDTV production standard in June, 1992. We

believe that this important U.S. development will, and should, play a central role in the future of U.S. HDTV origination.

The entry of the U.S. computer industry and the telecommunications industry into the examination of HDTV has further broadened the potential applications of HDTV within business and industry. The Commission wisely perceived the value of this vital inter-industry participation and has openly encouraged the contribution of all. The important decisions to be made over the next year should capitalize on all of this magnificent U.S. base of outstanding and far-reaching work. Only in this way can the high goals of both U.S. broadcasters and U.S. program producers be fully realized and the public interest served. Failure to do so would, we believe, needlessly frustrate the Commission's goal of prompt implementation of ATV service for the benefit of the American viewing public.

B. Sony and HDTV

It is against this backdrop that we offer the comments of Sony Corporation of America. Sony Corporation early embraced HDTV. We did so on a large scale, and at a time when many viewed such a revolutionary advance in television with skepticism, or at least, caution. We were early convinced that HDTV was inevitable; that it represented a quantum leap beyond existing television technology; and that it would have far-reaching impact

in many sectors of society, beyond simply enhancing the home entertainment experience.

As a result of Sony's commitment to HDTV, we have, from the beginning, actively participated on all of the U.S. committees working on this important project. We have sought to contribute on a continuing basis to the work of these committees by extensive supporting experiments, demonstrations, technical submissions and working-group participation. In doing so, we have drawn extensively upon our own experience and have tried to provide to these committees the benefits of that experience.

C. Sony's Perspective

Our comments focus on a small number of the issues presented within the Further Notice to which the Commission seeks public comment. In the main, we have confined ourselves to some important topics on which our specific HDTV technological developments, accumulated manufacturing expertise, and HDTV marketplace experiences can shed some useful insight.

The bulk of our comments are devoted to the major issue of HDTV broadcast origination equipment and, in particular, to what we believe is the critical need to reach an industry consensus on a single U.S. production standard. This belief stems from our focus, for a decade now, on the perfection of the all-important "front-end" technologies -- the total HDTV

Production system which, to this day, we consider to be the necessary underpinning for all of the many potential applications of HDTV. Although there is broad agreement on the need for a single production standard in order to lower costs of HDTV origination equipment and thereby facilitate the prompt introduction of this new technology, the broadcast, production, and equipment manufacturing industries have not yet united behind a particular standard.

The failure thus far to achieve agreement on this important issue is not due to the lack of an acceptable standard. As we discuss below, a superb standard, SMPTE 240/260M, already exists. As a result of our research on numerous fronts and our accumulated experience in HDTV, we believe that the 1125/60 system embodied in SMPTE 240M and the supporting digital SMPTE 260M represents an outstanding production standard which possesses the inherent flexibility to deliver impressive performance consistent with any of the transmission formats now under consideration by the Commission.[1] However, due to a

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[1] In our first comments, filed in 1988 in response to the Commission's first Notice of Inquiry, Sony urged the adoption of an HDTV production standard that is definitively separated from any form of ATV transmission standard. We argued that only this concept would allow the production standard to achieve its full potential of becoming a true electronic emulation of 35mm film imaging and thus gain a latitude in performance that would permit its application across multiple imaging industries and sustain high performance conversion to all of the world television systems. Four years later, the swift and decisive move of the U.S. to embrace groundbreaking new digital image compression technologies dramatically strengthens our premise. The complex, sophisticated ATV digital encoders (central to all of the proposed ATV transmission systems) perform such an enormous change to the total digital data rate between HDTV origination

variety of technical, competitive, political, and national interests that we do not wish to belabor here, that standard has not yet received the universal endorsement from relevant groups in this country that we believe its technical virtuosity merits.

It is our sober assessment -- based on intransigent technological imperatives and diverse marketplace realities -- that we no longer have the luxury of prolonging this debate. If the Commission's objective of bringing ATV to reality in a few short years is to be accomplished, it is critical that viable HDTV studio origination equipment be brought to the marketplace as rapidly as possible so that the long process of system refinement and product cost reduction can begin.

Based upon our experience, we do not believe that any region of the world can afford multiple HDTV standards. Most specifically, the U.S. broadcast industry, in isolation, cannot possibly hope to achieve the vital economies of scale in professional HDTV studio equipment that are so necessary to bring down their costs to the degree sought by all. Such economies of scale, achieved on a worldwide basis, will serve the public interest as well by facilitating the prompt introduction of this exciting new technology into the United States. This can only happen through cooperative action on the part of equipment manufacturers, program producers and broadcasters.

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and transmission that the all-important decoupling (between origination and transmission) we spoke of has now become a central reality to contemporary ATV thinking.

However, the economies of scale in production equipment that will flow from agreement upon a single production standard represent only part of the equation. Equally important is the achievement of similar economies in the production of consumer HDTV receivers. Only when ATV receivers become affordable through large volume production will the ATV penetration rate reach the high level necessary to justify final and complete conversion to HDTV and termination of NTSC service. Consumer willingness to invest in ATV receivers will depend not only on price but on the relative attractiveness of ATV versus other competing technologies such as multichannel NTSC service.

The availability of true HDTV programming will, in our opinion, play a decisive role in determining when the balance ultimately tips in favor of ATV -- as we believe it inevitably must. Consumers will only purchase ATV receivers in the volume necessary to have a significant impact on costs when sufficient programming is available that fully exploits and demonstrates the extraordinary potential of ATV. The provision of such programming by broadcasters is a function not only of the cost of HDTV production equipment but also of the experience of broadcasters and program suppliers in actually producing HDTV programming. In defining any simulcasting requirement, the Commission must strike an appropriate balance between these various factors, one which places as few constraints as possible on the new ATV service.

Finally, although we wholeheartedly agree with the Commission's determination to expedite the provision of ATV service to the American public, we do not believe that the Commission should now set the date for final termination of NTSC transmission. The Commission has recognized that conversion to ATV must necessarily depend upon consumer acceptance and utilization of this new technology. There are simply too many factors that might conceivably impact upon that consumer choice for the Commission to now set what necessarily must be an arbitrary date for the final change-over. Instead, we believe that the Commission should forthrightly link the NTSC termination date to the ATV penetration rate, thus recognizing that, in the world's greatest free market economy, the transition to HDTV ultimately must be governed by consumer choice rather than government declaration.

II. AVAILABILITY AND COSTS OF EQUIPMENT

The Further Notice specifically solicits comments from consumer electronics manufacturers and professional broadcast equipment manufacturers. See Further Notice, ¶ 54. Sony Corporation is both of these. The experience gained in those capacities guides our view of what is necessary to achieve the high production volume for professional and consumer equipment that is critical to achieving high market penetration rates. A broad-based ATV service will not be achieved in the United States

until broadcasters and consumers can afford to purchase the equipment necessary to produce and view true ATV programming.

A. HDTV Studio Equipment

1. The reality of HDTV Studio Equipment Pricing

In the 1980's fundamental **developments** occurred with respect to both the production and transmission of HDTV. The decade of the 90's, on the other hand, is the era of **implementation** - certainly testified to by the strong leadership of the Commission and by the developing response of U.S. broadcasters. The greatest impediment to HDTV implementation is not the Commission or broadcasters but rather the present high price of frontend and consumer HDTV equipment. HDTV equipment is costly due to the technological complexities required to achieve the high performance inherent in true HDTV and the relatively small amount of equipment being produced and sold at this time. The critical factor in implementation, and thus the singular challenge of the 90's with respect to HDTV, is to drive down the costs of these HDTV products. No degree of wishful thinking, or fiscal sleight-of-hand, will achieve this. Rather, these prices will be lowered only by a combination of the following factors:

- Unity behind a single standard;
- Growth in manufacturing volume;
- Global competition;

- Digital integration (with major commitment to LSI); and

- On-going manufacturing refinements

Of all of these factors -- **growth in manufacturing volume** is unquestionably most crucial. All globally competing professional television equipment manufacturers will agree that lowering costs on even traditional 525/625 broadcast-type equipments is difficult. Concerted efforts by all manufacturers, within a highly competitive marketplace, have produced only modest pricing reductions on current 525 NTSC studio equipment over the past decade. With HDTV -- where prices today hover at 3 to 5 times that of the highest-end 525 NTSC studio equipment -- the challenge is clearly greater.

The solution to the high cost of HDTV equipment is to increase the manufacturing volume. The volume of key television studio equipment sold in the U.S. marketplace often is measured in quantities of hundreds (studio cameras, for example) and at best, the quantities of video tape recorders, are measured in thousands. Nothing like the economies of scale in consumer electronic equipment comes into play, where volume often is measured in millions of units. Making major commitments to large scale digital integration simply cannot be justified based on volumes like these.

Understandably, because of their own desire to control costs, many broadcasters believe that only a modest premium (over current NTSC studio equipment prices) is justifiable for HDTV equipment. The definition of "modest" has ranged from zero to 100% in some recent statements. Either number is still far from where we HDTV manufacturers actually are today. Substantial volumes of HDTV equipment will need to be achieved in manufacturing in order to come anywhere close to such pricing goals. Nor does the cost of HDTV origination equipment alter very much as a function of the standard's technical parameters. 1125/2:1, 1050/2:1, or 787.5/1:1 formats all consume approximately the same bandwidth -- which is the real cost "driver." The key issue relating to the cost of any given HDTV production format is how widely will it be used? That is, what will be the **overall** volume of the equipment associated with that standard? Obviously, the more nearly universal the acceptance of the standard, both within domestic United States industries and internationally, the higher the volume of equipment that can be produced which utilizes that standard and, consequently, the lower the cost.

2. Sony Experience with HDTV Studio Equipment

For more than a decade Sony has applied our core technologies in Imaging, Recording, Digital Signal Processing, and Display to the advancement of HDTV equipments for program production, post-production, and master program distribution (by

video tape and optical disc). This huge investment is testament to our unwavering faith in the inevitability of HDTV - and to all of its beneficial manifestations within our emerging information society. A tremendous, hard-earned, global experience in HDTV production equipment that spans ten years has taught us a great deal indeed. This experience we believe can very directly contribute to a useful response to some of the questions posed by the Commission. Further Notice, ¶ 54.

We have, in total, delivered in excess of **150** 1125/60 HDTV cameras to the world marketplace over the past eight years. Our new HD CCD camera is enjoying an unprecedented success with a worldwide backlog of more than **60** units (Japan, Europe and the U.S.) having been achieved within the first six months of sales. Our all-digital 1125/60 VTR has become the mainstay of the global work in HDTV with more than **250** in service worldwide. More than **500** HD disc players and **2000** HD 1125/60 professional display systems have been installed. **We reveal these numbers to the Commission to make two points we deem vitally important:**

- We have an important HDTV **Manufacturing Experience** behind us and an important message to convey that is based on this experience and

- SMPTE 240M/260M is being establish as a de facto HDTV production standard - **worldwide** - in multiple market niches.

It is probably not well known just how successful the 1125/60 HDTV standard is proving in the highly demanding business, corporate, and industrial marketplaces -- all over the world. Four multi-national automobile companies now employ 1125/60 HDTV visualization systems within their design centers to streamline and extend creative conceptional design process. 1125/60 Electronic theaters have been open for some time to the U.S. public at the Coca Cola World Center in Atlanta, Georgia and at the National Gallery of Art, in Washington DC. An 1125/60 based system for combining HDTV, film and high-resolution computer generated imagery is fully operational in Culver City, Los Angeles, supporting serious Hollywood studio exploration in motion picture special effects (three major movies released in 1992 will have used 1125/60 HDTV for their special effect). The Sony all-digital 1125/60 video tape recorder is used by all of the U.S. ATV proponents in support of their R&D and it constitutes the heart of the ATTC test center. The list goes on.

The Commission asked for responses to some vitally pertinent questions regarding the timing of widespread availability of ATV professional broadcast equipment; the cost of such equipment; and the anticipated changes in these prices, during the proposed 15 year conversion period. We believe our responses to these crucial questions go beyond any mere conjecture. Rather, we offer some firm conclusions we have reached as a result of the protracted "learning" experience described above.

3. A U.S. Production standard

The Commission is well aware of the controversy that still surrounds the U.S. developed SMPTE 240M 1125/60 production standard. In recent weeks the supporting all-digital SMPTE 260M standard has emerged from SMPTE - the product of three years of superb work which encompassed the best effort of participants from diverse television-related industries. The U.S. is again first; SMPTE 260M is the world's first digital HDTV production standard.

We draw the Commission's attention to these points because Sony has extensive experience in actually putting our HDTV equipment to real work within a wide range of program production in Hollywood, across the U.S. and Canada, Europe and the Far East. Our original commitment to producing HDTV equipment in full conformance with this standard is now immeasurably strengthened by these experiences. The wisdom of the dozens of U.S. television and film experts who crafted SMPTE 240M in 1988 (and who continued this fine work through to the present day to produce the associated SMPTE 260M standard) has, in our view, been well vindicated as a major achievement anywhere else in the world.

Today, as the U.S. stands poised to begin a selection process that will choose one unique ATV transmission standard from among five superb contending proposals (four of them all-

digital) we can confidently report that **the status of HDTV production is very healthy indeed.** The fundamental research and development work is complete. The subsequent equipment manufacturing now is underway. The SMPTE 260M digital HDTV production standard is real, equipment conforming to it is already available from multiple manufacturers, and its program-making quality has proven indisputably to be the best in the world, without any exception.

The abilities of the SMPTE 260M origination format to be transferred to 35mm film at very high quality, to be digitally downconverted to existing 525 and 625 television with equal ease, and to be converted to the ATV transmission formats proposed for the U.S. and for Europe, all provide an important assurance that U.S. program producers (including our U.S. broadcasters) can effectively compete in the worldwide export market for programming. Thus the broad interest of the all-important U.S. program-producing industry is well protected -- for the long term. The origination data rate of SMPTE 260M considerably exceeds that required for any of the proposed ATV transmission systems -- and this important technical "overhead" ensures superb conversion to all of the ATV transmission encoder requirements (in addition to quality conversion to the 525 and 626 television systems). This issue of quality conversion to all distribution media -- present and future - is vitally important to U.S. program producers.

We have taken some time to first review the status of the HDTV production standard -- and our own substantially increased confidence in this superb standard -- because we now wish to make some important points in direct response to the Commission's questions to professional television equipment manufacturers.

4. The Marketplace Reality of 1125/60 SMPTE 240/260M Equipment

It is not widely appreciated just how large a goal was set by those who wrote the early proposals for HDTV. We completely subscribe to the school of thought that considers HDTV revolutionary -- rather than some evolution of our existing 525/625 systems. Those criteria established for a wider screen, more than 1000 scanning lines, and the substantial increase in horizontal resolution were all based on a large body of psychophysical research. The result was a set of new television origination criteria, producing more than **five times** the total resolution of today's 525 NTSC studio capture. The special significance of this high goal was that it took all of the past decade to develop basic television camera, video tape recording, and digital signal processing technologies that could actually implement such real time electronic imagery. The goal remains very high -- but today it is achievable.

Sony Corporation made a massive investment over the past decade to master these basic technologies and to achieve

what we believe to be a vital first platform -- that combines a practical, high performance level with achievable implementation. As one striking example, it has taken us no less than four generations of camera design and technology to finally achieve in 1992 an HDTV camera performance level that exploits all of the superb imaging capability latent within the 1125/60 SMPTE production standard. Now, as U.S. broadcasters stand poised to enter an ATV era -- HDTV cameras are ready (and we do include the commensurate fine developments of our competitors) in terms of performance to produce the superb imagery that will support any required form of HDTV broadcast origination.

In the U.S., these unprecedented equipment development achievements on the part of multiple manufacturers have been achieved, so far, **without the usual vigorous participation of U.S. broadcasters** (who traditionally have worked closely with professional television manufacturers in the development of NTSC broadcast equipment). The manufacturers have made these huge investment commitments, by themselves, in the basic belief that HDTV is inevitable -- and perhaps, more important, in our conviction that HDTV imaging will ultimately span across multiple important industries -- including, of course, the broadcasting industry of the future. But the close collaboration of the U.S. broadcaster is now very much needed to further refine these products over the coming years and guide the drive to lower costs.

5. A Broad based U.S. HDTV Production standard?

All of our studies within Sony clearly show (even for some very optimistic scenarios) that **the U.S. broadcasting industry, by itself, cannot even come close to cultivating the volumes of HDTV studio equipment that will drive costs down to levels they might find acceptable.** We believe similar conclusions have been reached by all global professional HDTV equipment manufacturers.

The only solution -- again -- is substantially higher volume. This can only be achieved by amortizing all of the contributing costs for HDTV manufacturing across multiple industries. HDTV offers an unparalleled opportunity to do just that. A high-end electronic real time imaging system, which combines 35mm photographic quality with the electronic dexterity of television is already finding novel application in multiple sectors and niches of business, industry, corporate, scientific, medical, governmental, visualization, training -- as closed circuit systems offering unique solutions to diverse system needs. Sony is heavily engaged even today in developing these new markets. And again, we are struck with the marvelous performance criteria written into the many parameters of SMPTE 240M/260M. This is indeed proving to be a powerful new electronic medium and our confidence is very high that it will become ubiquitous.

Use of production equipment conforming to that standard is now occurring not only in various nonbroadcast sectors in the United States but internationally as well. Over the past two years no less than eight commercial HDTV production and post-production facilities have been established in four European countries -- all operating on the 1125/60 production standard. This speaks volumes about marketplace pragmatism and the recognition of a standard that has significant worldwide implications. Europe clearly will use a 1250/50 based transmission standard, but nevertheless, many program producers see the advantage of the higher performance of 1125/60 production and the huge advantage of a global economy of scale in this equipment.

We cannot urge strongly enough to our colleagues in the U.S. broadcasting industry to put aside the continuing sparring over contending HDTV production standards and the futile search for the perfect "tailor made" uniquely broadcast-only origination standard. **The broadcast industry cannot afford a unique HDTV production standard.**

There is today a U.S. HDTV production standard. The broadcast industry needs no R&D investment for their HDTV origination needs. The job is done. We have a broad experience that now clearly shows that no other proposed standard anywhere in the world equals the performance of SMPTE 240/260M. There is an opportunity -- and a short window of time -- for U.S. industry